

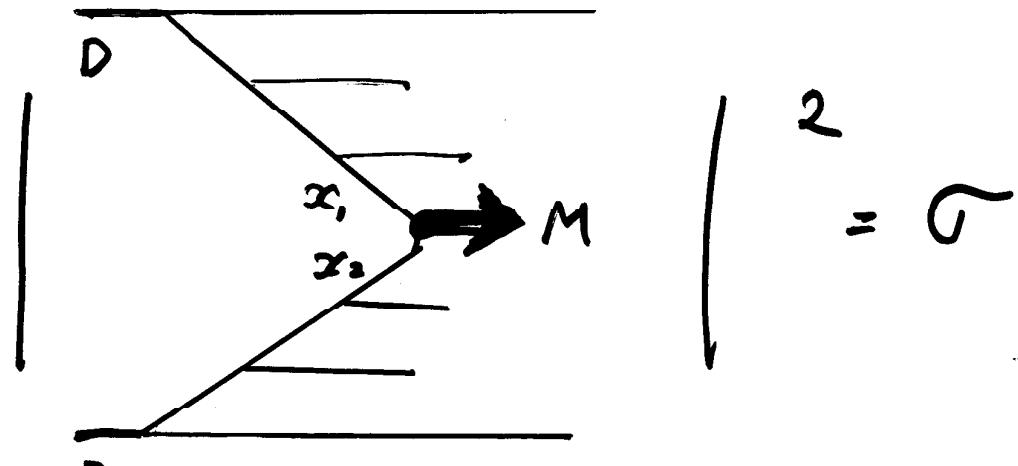
(1)

A new mechanism of
hard inclusive production
and
violation of
factorization theorem.

E. Levin / Tel Aviv Un.

E. Gotsman, E. Levin and U. Maor:
TAUP 2416/97

● F.T.



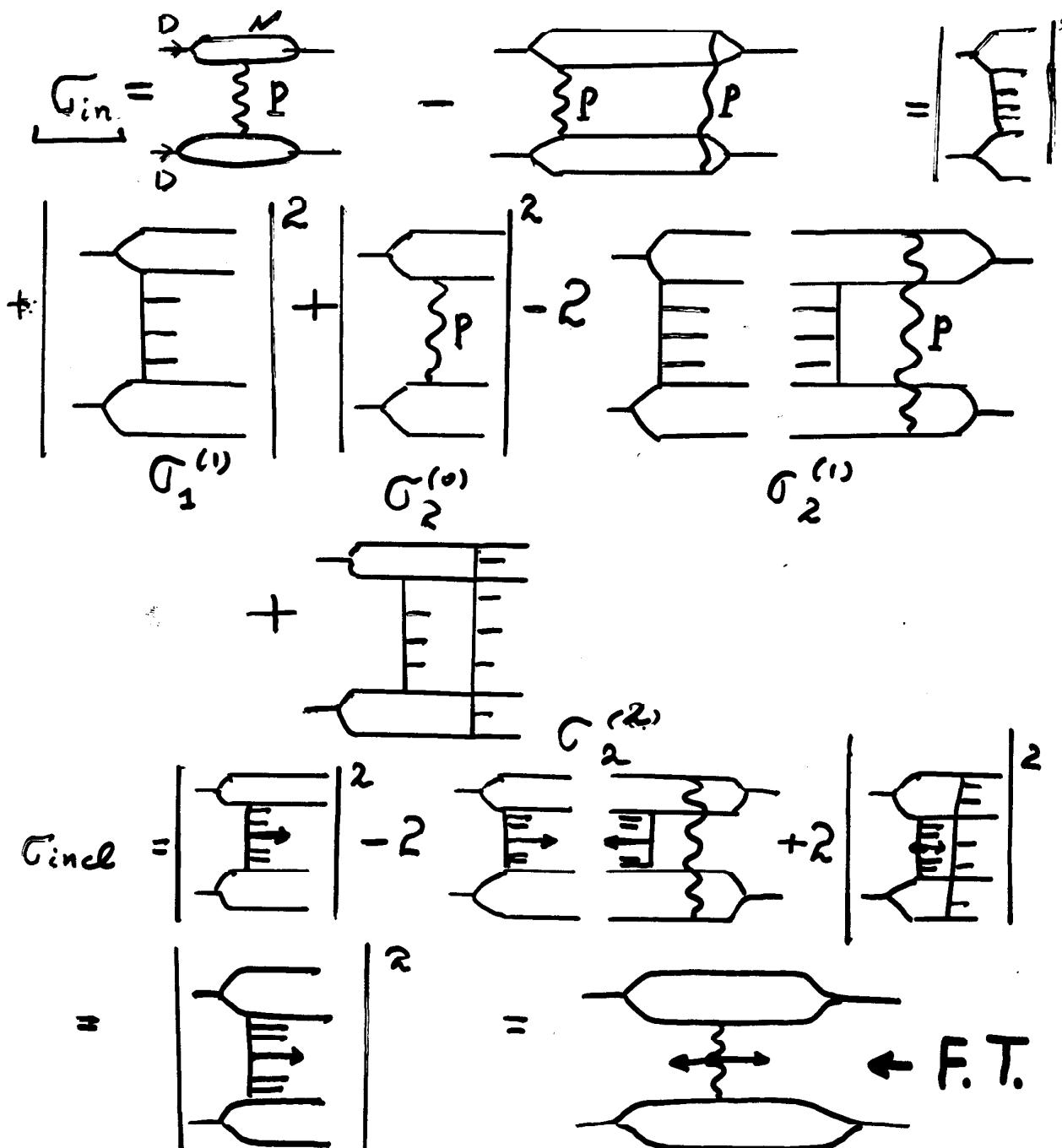
$$\bar{G}(\text{Higgs}) = \int dx_1 dx_2 F_D(x_1, M^2) F_D(x_2, M^2).$$

$\sigma(\text{hard})$

J. C. Collins, D. Soper and G. Sterman
Nucl. Phys. B308 (1988) 833.

● F.T. from AGK cutting rules.

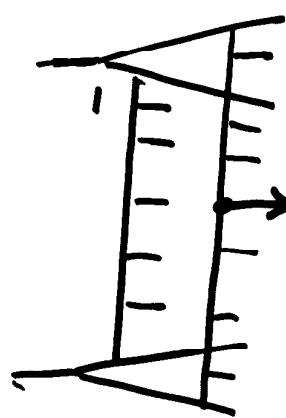
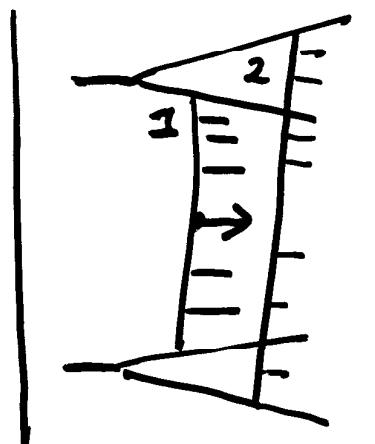
↳ Abramovski, Gribov, Kancheli
Sov. J. Nucl. Phys. 18 (73) 308



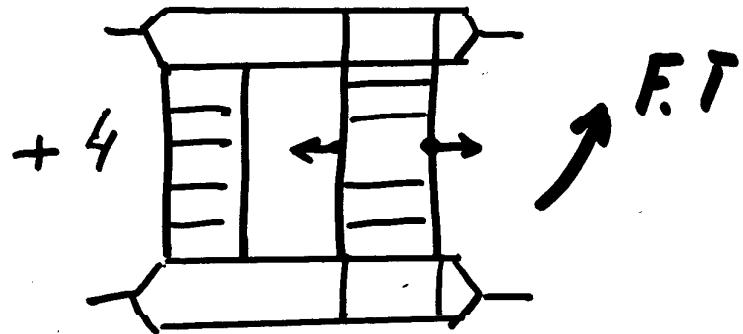
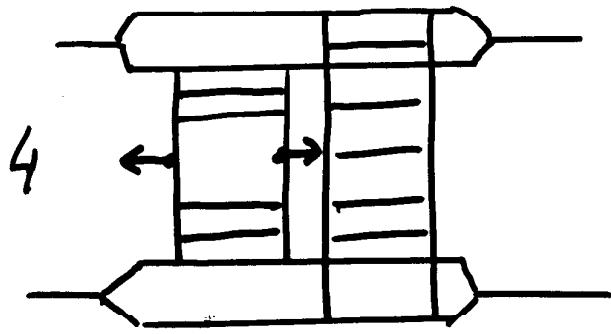
$$F_D = 2 F_N$$

● What was wrong ?

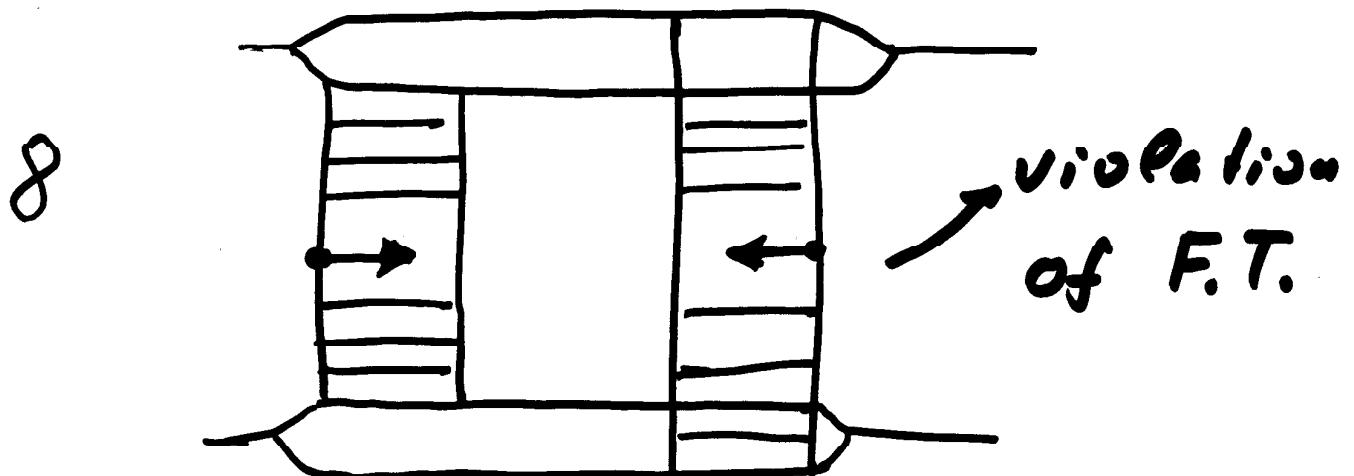
4



=



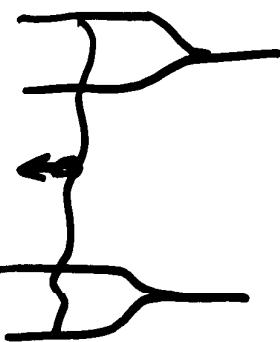
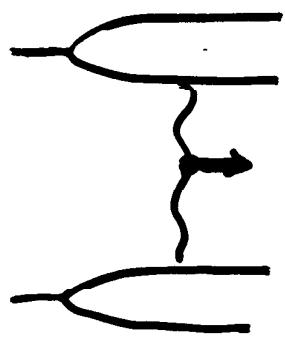
+



Violation
of F.T.

● Sum of all new contributions.

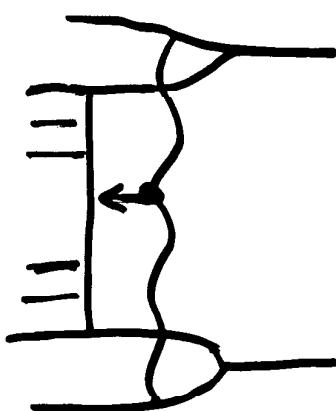
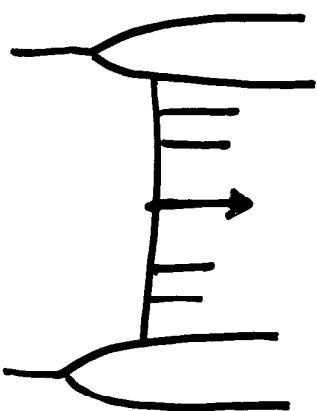
2



$\sigma^{(0)}$

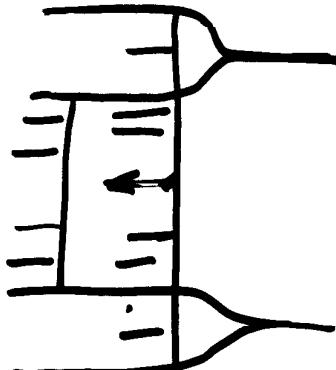
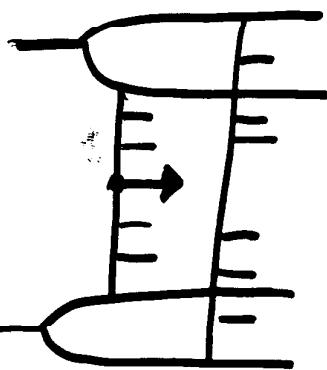
Double Pomeron
Higgs production

4



$\sigma^{(1)}$

2



$\sigma^{(2)}$

$$\sigma^{(0)} = 8g_H^2 \{ (\text{Re } A_P)^2 + (\text{Im } A_P)^2 \}$$

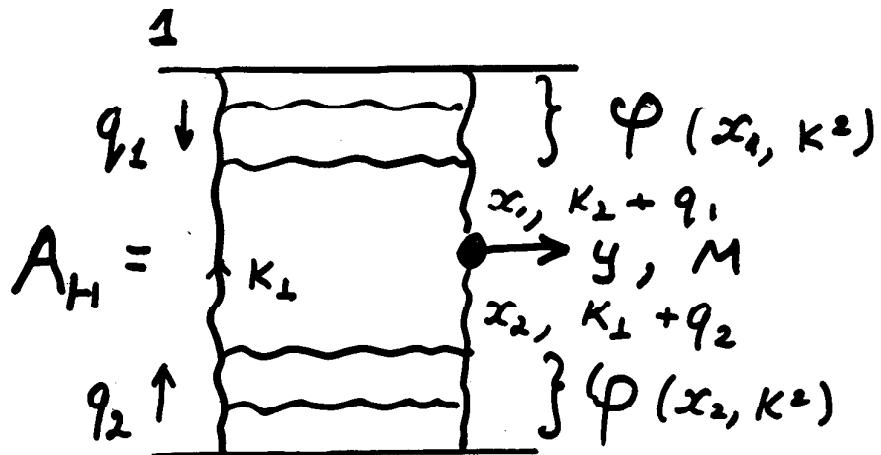
$$\sigma^{(1)} = -16g_H^2 (\text{Im } A_P)^2$$

$$\sigma^{(2)} = 8g_H^2 (\text{Im } A_P)^2$$

$$\boxed{\sum = 8g_H^2 (\text{Re } A_P)^2}$$

● Calculation

A. Bialas, P. Landshoft
 Phys. lett. B 256 (51) 540



- $\tilde{\mathcal{G}}^{n.d.}(x_1, k^2) \rightarrow \varphi^\alpha(x, k^2)$
 $x_1 \ll 1$

- $$\frac{d\tilde{\mathcal{G}}}{dy} = \int \frac{d\tilde{q}_{1t} d\tilde{q}_{2s}}{(16\pi)^2} |A_H|^2 =$$

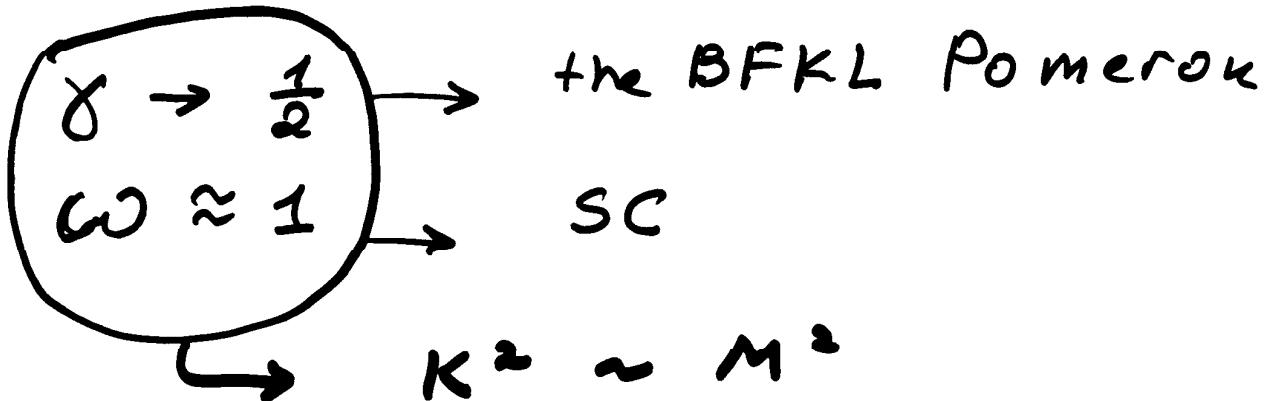
$$= \frac{2\pi^2}{R_1^2 R_2^2} G(\text{hard}) \left| \int_{Q_0^2}^{M^2} dK_1^2 \frac{\partial \varphi_1(x, k^2)}{\partial \ln \frac{1}{x_1}} \varphi_2(x_2, k^2) \right|^2$$

- $$R = \frac{2\pi^2}{R_1^2 R_2^2} \frac{\left| \int_{Q_0^2}^{M^2} dK^2 \frac{\partial \varphi_1(x_1, k^2)}{\partial \ln \frac{1}{x_1}} \varphi_2(x_2, k^2) \right|^2}{x_1 G(x_1, \frac{M^2}{4}) x_2 G(x_2, \frac{M^2}{4})}$$

- $$ds \times f(x, Q^2) = \int_{Q_0^2}^{Q^2} d_s(k^2) \varphi(x, k^2) dK^2$$

● Where R could be large?

$$\varphi = C \left(\frac{1}{x}\right)^\omega \frac{1}{k^2} (k^2)^\delta$$



● Numerical estimates

$\varphi \rightarrow$ the GRV parameterization

$R_1^2 = R_2^2 = 5 \text{ Gev}^{-2}$ (HERA data
on DD)

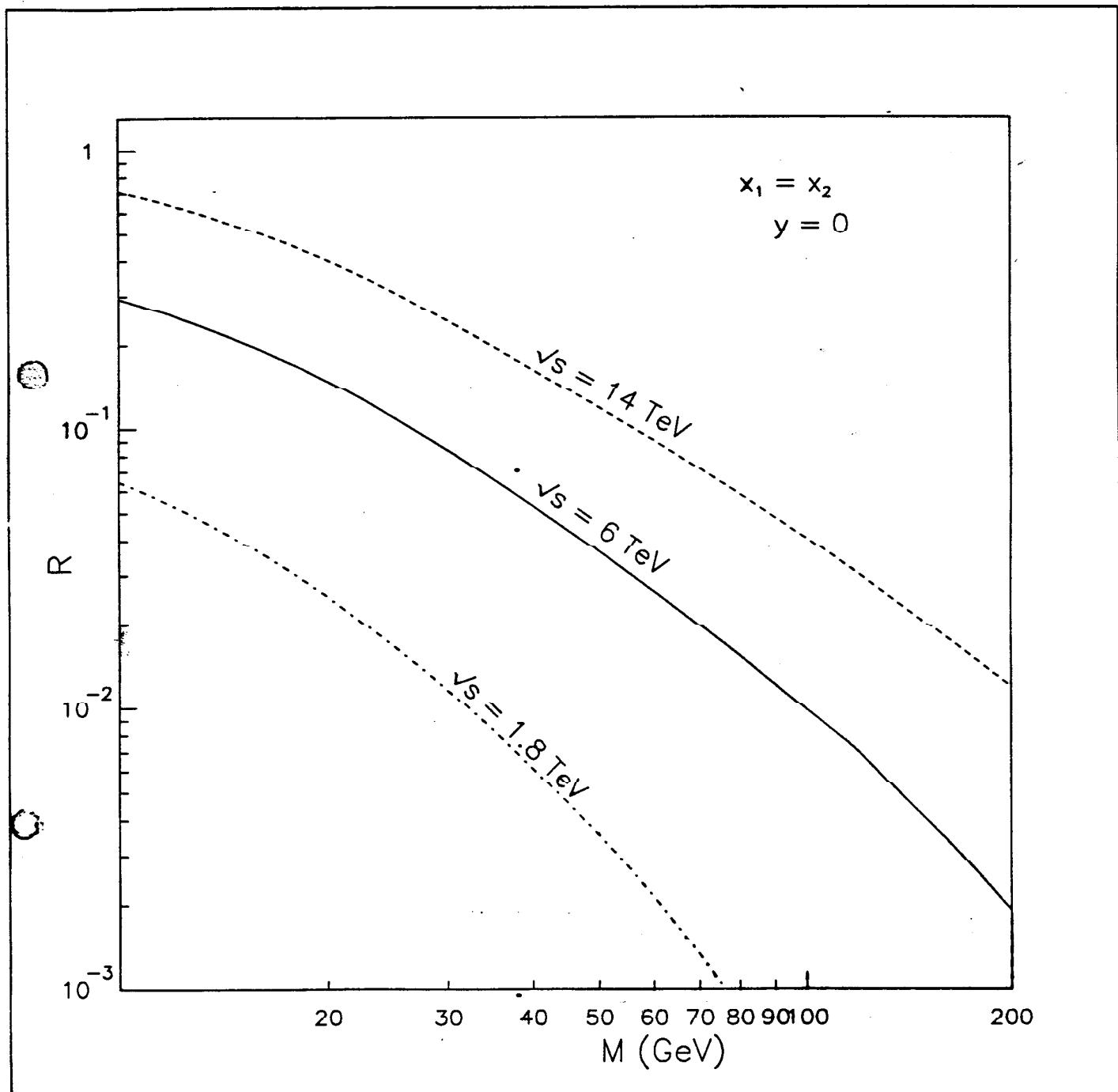
$$y = 0$$

Fig. →

$$M = 2 p_{\perp}$$

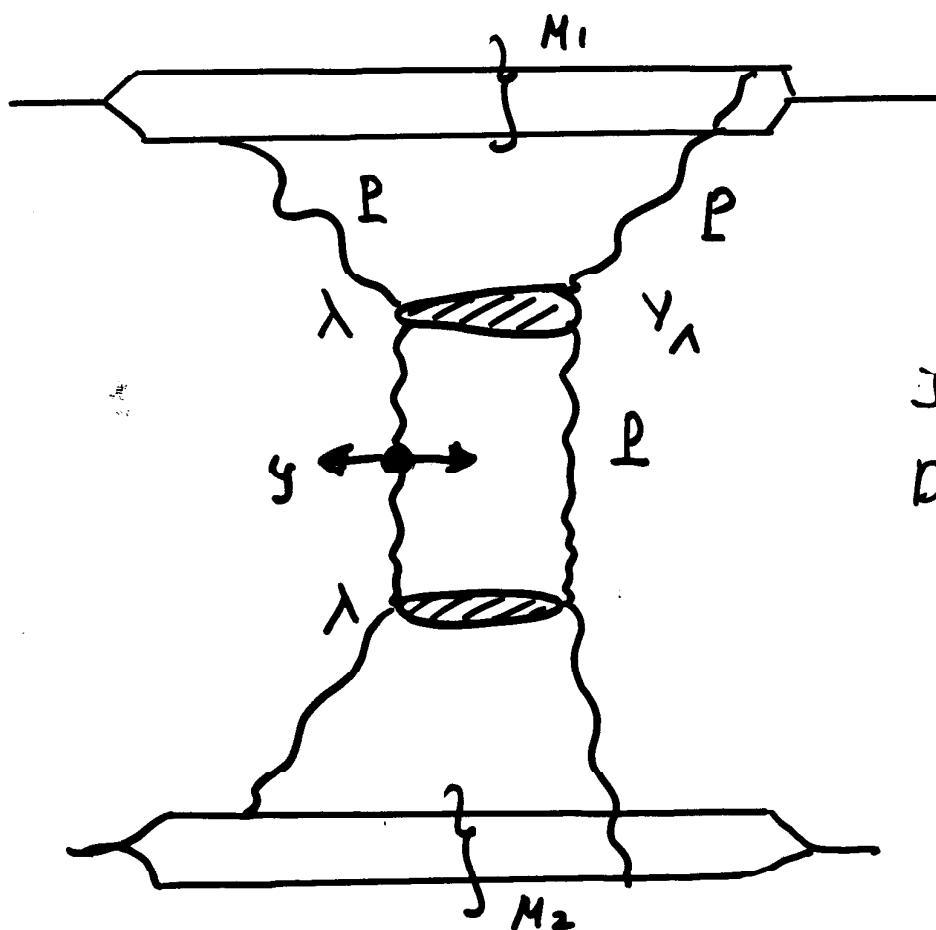
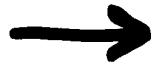
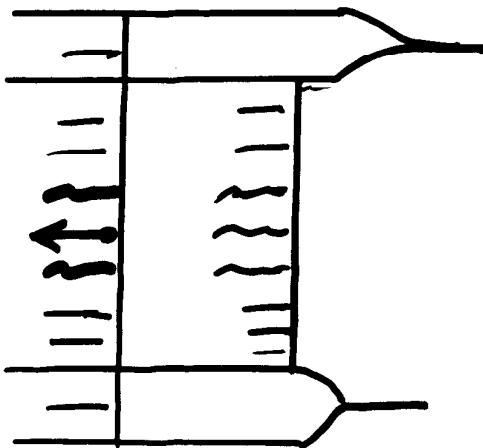
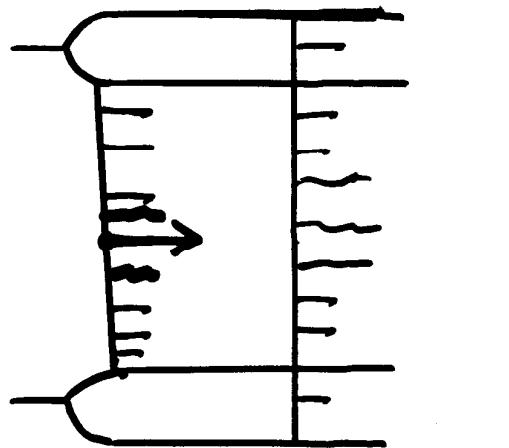
For $A + A$ factor

$$\left(\frac{R_B^2}{R_0} A^{k_3} + 1 \right)^2 \approx 4 - 9$$



General Approach.

3



J. Bartels, M. Ryskin
DESY 96-238
hep-ph 9612226

$$\frac{dC}{dy} = \int p^2 \frac{dG}{dy} (D+D \rightarrow M_1(n\pi_1) + LRG + (H+x) + LRG + M_2(n\pi_1))$$

● Results

- Violation of the FT due to a new mechanism of inclusive production.
- For hard inclusive production the new mechanism yields a sizeable contribution especially at LHC energy and/or nucleus-nucleus interaction.
- The proof of F.T. should be reconsidered to find a general source of its violation.